

Strassburg, at which with his chief, Dr. Luigi Palazzo, he acted as a delegate for Italy, he brought forward a scale for seismic intensities which he followed by a paper on the possible relationship between small changes in latitude and the occurrence of large earthquakes. His last published paper relates to the advantages to be obtained from continuously moving high speed record receiving surfaces.

Seismologists throughout the world know Cancani's work, but those who were privileged to know him personally have stored up remembrances of an enthusiastic worker, gentle and persuasive in his speech, and with a kindness of disposition of rare occurrence. He leaves behind a gap difficult to fill, a loss to a family, to a department, and to a new science.

J. M.

## NOTES.

PROF. GEORGE DARWIN, F.R.S., has been elected president of the British Association for the meeting to be held in South Africa next year.

At the monthly meeting of the Royal Institution on Monday, the thanks of the members were returned to Dr. Andrew Carnegie for his donation of 1200*l.* to enable Prof. Dewar and Mr. R. A. Hadfield to prosecute their joint investigation on the physical properties of steel and other alloys at low temperatures; and to Dr. Frank McClean for his donation of 100*l.* to the research fund of the institution.

PROF. C. S. SHERRINGTON, F.R.S., has been elected a member of the Imperial Academy of Medicine, Vienna.

IT is reported that the University of Göttingen has awarded its Otto Wahlbruch prize, of the value of 600*l.*, to Prof. Wilhelm Pfeffer, professor of botany at Leipzig. The prize is awarded for the most important contribution to science during the past two years.

At the annual meeting of the Association of German Chemists, held at Mannheim on May 25, the Liebig gold medal for distinguished services in applied chemistry was presented to Dr. Rudolf Knietsch, of the Badische Anilin- und Soda-Fabrik, the discoverer of the so-called contact process of sulphuric acid manufacture.

On the recommendation of the Rumford committee, the American Academy of Arts and Sciences has awarded the Rumford medal to Prof. E. F. Nichols, of Columbia University, for his researches on radiation, particularly on the pressure due to radiation, the heat of the stars, and the infra-red spectrum.

Science announces the death of Mr. Frederick A. Walpole, botanical artist of the U.S. Department of Agriculture. He was considered the best plant artist in the United States, his drawings having been used to illustrate various reports published by the Department of Agriculture and the Smithsonian Institution, as well as the narrative of the Harriman Alaska Expedition.

A REUTER telegram from Frankfort-on-Main says that at the forty-fifth general meeting of the German Engineers' Association the Grashof medal, instituted in honour of the founder of the association, was unanimously conferred on the two pioneers of steam turbine propulsion, the Hon. C. A. Parsons, of Newcastle-on-Tyne, and M. de Laval, of Stockholm.

THROUGH the efforts of an organisation known as the Edison Medal Association, a fund has been created to establish a medal to be known as the "Edison Medal,"

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and the responsibility of annually awarding it has been entrusted to the American Institute of Electrical Engineers. A medal will be awarded this year by a committee soon to be selected from among the members of the institute.

REUTER'S Agency learns that the expedition which left England in February under Lieut. Boyd Alexander for the forest region between the west coast and Lake Chad arrived in canoes at Ibi, 250 miles up the Binue River, in April. The explorers had already made some collections on the Binue, and intended landing at Ibi with the view of pushing north into Bauchi.

An official communication issued at Simla on May 17, and published in the *Pioneer Mail* of May 20, contains the following remarks:—"It has recently been stated in certain newspapers that the Government of India have rejected the offer made by Mr. Tata of a donation for aiding the foundation of an Institute of Science. This assertion is absolutely without foundation. So far from having rejected Mr. Tata's offer, the Government of India have promised a large subsidy to the scheme, and they have throughout the negotiations done everything within their power to facilitate its progress and aid the realisation of a project which has their fullest sympathy."

DR. FRIEDRICH SIEMENS, who died in Dresden a few days ago, was born in 1826 at Menzendorf, near Lübeck, and received his education in that town. In 1848, says the *Electrician*, he came to England to introduce his brother's, Dr. Werner Siemens, telegraphic apparatus. Afterwards he worked with his other brother, the late Sir William Siemens, and succeeded in applying the latter's regenerative principle to furnaces in combination with gaseous fuel, thereby making possible the production of open-hearth steel and the melting of glass by the continuous process in tanks. He also invented the regenerative gas burner and stove, and brought out numerous inventions connected with the glass industry.

A REUTER message from Queenstown states that Mr. Marconi is among the passengers on board the outward bound Cunard Steamer *Campania*. The daily newspaper which the Cunard Company have arranged to publish on board their four largest boats will be produced under Mr. Marconi's personal supervision. There will be a regular editor and printing staff on board each liner. The news received from shore will be supplied through Reuter's Agency. Mr. Marconi stated that he would have the *Campania* in communication with America on Monday through Cape Breton station, and would keep in communication with the Cornwall station until Wednesday night or Thursday morning.

MR. J. DONOVAN, 1 Anstey Road, Denmark Hill, S.E., would be glad if psychologists or other investigators could send him information or references bearing upon the following points:—(1) A fairly representative list of animals, invertebrate and vertebrate, that make sounds in extreme pain or distress, although such sounds never serve to induce their fellows to help or relieve them, or even attempt to do so. (2) (a) Have any observations or experiments been made to show whether the sound or cry of pain or shock has any influence toward hindering or checking the oncoming of catalepsy or swoon in the animal producing the sound? (b) Are animals that do not possess means of sound production more subject to catalepsy from pain or shock than those which possess means of sound production?

DR. LUIGI MAGRI contributes to the *Atti dei Lincei*, xiii. (1), 9, some observations on the relation of the index of

refraction of air to the density. It appears that the index of refraction increases more rapidly under pressure than is consistent with the law  $(n-1)/d = \text{constant}$ , whereas the value of  $(n^2-1)/(n^2+1)d$  is practically constant except at low pressures, where the observations could not be made with a great degree of accuracy.

DR. STEPHANE LEDUC, of Nantes, has communicated to the French Physical Society a note on crystal formation, advancing the hypothesis that the phenomenon of crystallisation depends not only on the arrangement of the molecules in geometric forms, but also on the movement of these molecules through the liquid in certain regular and geometric directions. This hypothesis is based on the author's observations on crystallisation in liquids thickened by colloids.

It is well known that two triangles in the same plane may be homologous in 1, 2, 3, 4 or 6 different ways at the same time, and that two tetrahedra may be homologous in 1, 2 or 4 different ways, it being assumed in either case that there are no common vertices. Prof. Luigi Berzolari contributes a note to the *Atti dei Lincei*, xiii. (1), 9, in which it is shown that in space of more than three dimensions two pyramidoids cannot have more than one centre of homology unless they possess common vertices or corners.

THE results of meteorological and magnetical observations made at Stonyhurst College Observatory during 1903 have been published in the usual concise form, with the exception of the valuable appendix containing the Malta meteorological returns. Father Sidgreaves states that the year will be known as the wet year, the rainfall being 11.8 inches above the annual average. Notwithstanding the unfavourable weather, the solar surface was observed on 207 days, and 141 plates have been added to the collection of stellar photographic spectra.

WE have received from the Deutsche Seewarte part xii. of *Ueberseeische meteorologische Beobachtungen*, containing carefully made observations, three times a day, at the following remote localities:—Marshall Islands (two stations), Nauru (lat. 26° S., long. 167° E.), Apia (Samoa), Tsingtau (lat. 36° N., long. 120° E.), and Rarotonga (Cook's Islands). With the exception of the latter station, all the observations were taken at the German colonies in the Pacific Ocean. It is worthy of note that the preparation of this very valuable work has been financially supported by the Colonial Department of the German Foreign Office.

CAPTAIN D. WILSON BARKER, in his presidential address to the Royal Meteorological Society, reviewed the past and present condition of ocean meteorology. The importance of this branch of science led to the international conference on meteorological observations at sea at Brussels in 1853, and to the establishment of the Meteorological Department of the Board of Trade by Mr. Cardwell in the following year, under the superintendence of Captain (afterwards Vice-Admiral) FitzRoy. He and Captain Maury in the United States (more especially the latter) are recognised as the most successful pioneers of ocean meteorology. Maury constructed wind and current charts for all oceans, copies of which were supplied gratuitously for the use of navigators in this country, and FitzRoy and his small staff at once set to work on them, and converted the pilot charts (which showed the wind directions numerically under each principal point of the compass) into graphical "wind-stars," and subsequently (about 1859) FitzRoy commenced the publi-

cation of a new series of monthly (instead of quarterly) charts, including wind-force and other data obtained from log-books collected by the Board of Trade Department. Other countries, especially France, Germany, and Holland, also pursued the subject vigorously; the Deutsche Seewarte published, among numerous other valuable works, an atlas of thirty-six charts of the Atlantic Ocean. In 1874 another international maritime conference was held in London, and was attended by representatives of all the principal nations. In this country the Meteorological Council, with the cooperation of the Hydrographic Office of the Admiralty, continues to devote untiring attention to this important subject. Captain Barker's able summary is contained in the *Quarterly Journal* of the Royal Meteorological Society for April last, and is illustrated by maps drawn on Flamsteed's projection, showing very clearly the principal meteorological elements, five or six maps being devoted to each of the great oceans.

WE have to acknowledge the receipt from the Field Columbian Museum, Chicago, of copies of three papers on mammals by Dr. D. G. Elliot, published last year.

We regret to find that in the notice of Mr. Regan's paper on the classification of fishes in our issue of June 2 (p. 109), the Teleostei are stated to be derived from the Chondropterygii instead of from the Chondrostei.

ACCORDING to a well illustrated article in the March number of the *American Naturalist* by Prof. E. A. Andrews, the assumption that the breeding habits of the American crayfish are identical with those of its European relative proves to be incorrect, and it turns out that there are considerable differences in this respect between the two species. The second article in the same issue, by Mr. W. M. Smallwood, is devoted to the natural history of the bulla-like mollusc known as *Haminea solitaria*.

ALL recent experiments on keeping animals in menageries in the open air seem to point to the superiority over the old plan of confining them in close and narrow cages. In the report of the Zoological Society of Philadelphia for 1903, for instance, it is stated that the raccoons in the society's menagerie were recently placed in an open enclosure containing a tall tree with a cavity at the base, and a hollow log. With these natural retreats at hand, it is noteworthy that the raccoons preferred to pass their time in winter, even during most inclement weather, high up in the tree, some 40 or 50 feet above the ground. In the same report the importance of pathological investigations into the causes of death of animals dying in menageries is urged.

THE Australian Ornithologists' Union is to be congratulated on the completion of the third volume of its official organ, the *Emu*. Efforts are to be made in the immediate future to render this valuable journal more strictly scientific. The part before us contains a coloured plate of two species of honey-eater, which, although described many years ago, have never previously been figured.

ACCORDING to the report for 1903, there is a satisfactory and continuous increase in the amount of gate-money taken at the Giza Zoological Gardens, the receipts for that year being £1213 (Egyptian), against £1037 in 1902. An extremely interesting feature in the report is the notes on the habits of the numerous species of Nile fishes kept in the aquarium. From these it appears that the proboscis-fish (*Mormyrus kannume*) is chiefly nocturnal, and employs its long snout in probing about among stones for animal food.

Very remarkable is the statement that in the case of *Hydrocyon forskali* it was found advisable to keep a light burning near the tank in order to prevent the fish from injuring themselves by swimming violently against the glass walls.

An official publication issued at Colombo by the Government printer contains a summary of Prof. Herdman's report on the pearl oyster fisheries of the Gulf of Manaar, which may be considered as supplementary to the report on the same subject published by the Royal Society in November last, and already noticed in our columns. After referring to the condition and extent of the oyster-banks, the present report briefly points out the chief sources of injury to the molluscs, after which reference is made to the mode of formation of pearls, and the best methods of pearl-fishing. The report concludes with a series of recommendations, among which are comprised the substitution of dredging (in many instances) for diving, and the advisability of the appointment of a permanent naturalist.

An apparent instance of mimicry of a most remarkable type is recorded by Dr. A. Willey in *Spolia Zeylanica* for April (vol. ii., part v.). The attention of Dr. Willey had been directed by a correspondent to the striking resemblance presented by one of the Cingalese fishes commonly known as sea-bats (*Platax vespertilio*) to a decayed leaf, and soon after he had the opportunity of verifying this statement for himself. "I was walking," he writes, "along the reef in the company of a fisherman carrying a net when he espied a small fish, which he attempted to catch for me. I could not see what it was at first, but noticed that the man failed to bag it after several ineffectual attempts. The fish did not swim far away from the spot, but dodged about, baffling its pursuer. I approached and seized the net, whereupon I saw a yellow jak-leaf gently and inertly sinking to the bottom. This is no unusual sight, and I was about to turn away, when the leaf righted itself and darted off. Efforts were redoubled and the fish secured and sketched. . . . When a fish has a leaf-shaped and leaf-coloured body, and in addition the unique habit of toppling over and feigning death when pursued, it seems natural to conclude that it is a genuine example of protective resemblance."

MANY of the visitors to Kew Gardens who take a special interest in the orchid houses will be interested to know that a revised edition of the "Kew Hand-list of Orchids" has been published, with the usual interleaved blank pages to facilitate the jotting down of notes. The increase in the number of genera, at any rate in the plants shown in the houses, has been very evident, and the catalogue gives a total of 220 for the collection.

THE large proportion of economic questions which occupies the attention of the botanical departments in our colonies is well shown in the *Bulletins* (January, April) of the Botanical Department in Trinidad. A striking analysis of samples of sugar canes grown in Florida is quoted in an extract, in which no reducing sugar was found. The proportion of the sugars in canes is not only important from a commercial point of view, but as a purely scientific question is well worth investigating. The recommendation of carbon bisulphide as an insecticide affords evidence of the spread of scientific knowledge amongst planters. Other useful articles refer to prussic acid in cassava, rubber analyses, and treatment of "black pod" on cacao estates.

PROF. ERIKSSON returns to his mycoplasm theory, which asserts that just fungi can hibernate in a protoplasmic form in the leaf-cells of the host, in a paper which appears in the *Transactions* of the Royal Swedish Academy of Sciences, vol. xxxvii., part vi., January. The investigations which were carried out by Dr. Eriksson and Dr. Tischler consisted in collecting the leaves of varieties of wheat which are liable to rust, and examining them both in late autumn and the following early summer, when no fungal mycelium could be observed, but in certain cells the authors distinguished a special dense accumulation of protoplasm, the mycoplasm. Later in July, intercellular fungal tubes were found which gradually developed into the ordinary hyphae. The change from the mycoplasmic to the intercellular condition which is assumed still requires confirmation.

MR. C. FOX-STRANGWAYS has prepared a second edition of his memoir on the Oolitic and Cretaceous rocks south of Scarborough (Geological Survey, price 4s. 6d.). More than twenty years have elapsed since the first edition was published, and opportunity has been taken of adding a series of pictorial views illustrating the fine cliff-sections, while the subject-matter is amplified throughout. The results of recent researches on the Speeton Clay are incorporated, and the author has dealt more fully with the interesting topics of scenery and denudation.

IN an article on recent changes in the elevation of land and sea in the vicinity of New York City, and from a study of tidal observations on both sides of the Atlantic, Mr. G. W. Tuttle (*Amer. Journ. Sci.*, May) comes to the conclusion that the mean sea-level oscillates in an irregular manner, having an average period of about eight years. These oscillations appear to be largely due to changes in atmospheric pressure, and the resulting changes in wind velocities. In addition to the above movements, Mr. Tuttle finds that some ports show a more or less continuous rising of the sea relatively to the adjacent land, others a lowering of the sea-level in its relation to the land, and still others maintain a constant relation between the two. These last make it clear that, except for the periodic changes noted above, the sea does not change its level, and that the relative changes are due to land movements. Observations at New York City show that since 1875 the land has been subsiding at about 1.45 foot per century.

MESSRS. PHILIP HARRIS AND CO. have sent us a pamphlet giving a descriptive account of some new models and apparatus to be used in teaching the measurement of volumes, designed by Mr. S. Irwin Crookes.

MESSRS. WATTS AND CO. have published for the Rationalist Press Association, Ltd., a pamphlet entitled "What to Read: Suggestions for the better Utilisation of Public Libraries," which contains the substance of an address delivered by Mr. John M. Robertson. Many useful hints to parents and librarians who wish to develop in children a love of reading and a regard for good books may be gathered from the address. The price of the pamphlet is fourpence.

WITH the growth of the Stassfurt industries and the increasing application of potassium salts in agriculture, a rapid method of estimating potassium has become a question of some importance. In the May number of the *Gazzetta*, N. Tarugi describes a volumetric method of estimating the element which depends on its precipitation in the form of the sparingly soluble persulphate. The method is accurate,

and can be carried out with great rapidity. Incidentally, the existence in aqueous solution at temperatures between  $0^{\circ}$  and  $40^{\circ}$  of four hydrates of potassium persulphate is established.

SOME experiments by Mr. K. E. Guthe, published in the April number of the *Physical Review*, show that fused steatite or soapstone can be used as a substitute for fused quartz in the production of fibres of very small elastic fatigue suitable for suspensions. The soapstone can be melted in a gas-oxygen jet, and very fine fibres are easily drawn out from the clear bead thus obtained. The elastic fatigue and tensile strength of these fused steatite fibres have approximately the same value as fused quartz fibres of the same dimensions. In the same journal Mr. J. H. Hart describes a continuous method of steam calorimetry which, with simple apparatus, gives results which compare very favourably with the best results obtained by the admittedly excellent continuous electrical method.

AN exhaustive account of investigations with the respiration calorimeter, by Messrs. Armsby and Fries, on the available energy of timothy hay has been issued as *Bulletin* No. 51 of the Bureau of Animal Industry of the U.S. Department of Agriculture. According to well known experiments of Rubner, different nutrient materials—proteids, fats, and carbohydrates—can replace each other in the animal metabolism, and “isodynamic values” can be deduced for the various nutrients. The authors question the applicability of Rubner’s generalisation to herbivorous animals, and their experiments indicate that the digested matter of hay is not isodynamic with body tissue when the food supply is below the maintenance ration. It was found that only 63 per cent. of the metabolisable energy served to prevent loss of tissue, while 37 per cent. simply increased the heat production of the animal.

A VERY interesting paper dealing with the constitution of the ammonium compounds is contributed by Dr. J. C. Cain to the current volume of the *Memoirs and Proceedings* of the Manchester Literary and Philosophical Society (vol. xlvi., No. 14). To take examples, the author’s suggested formulae for ammonium chloride and ammonium hydrate are  $H_3N=CIH$  and  $H_3N=OH_2$ , in which the chlorine and oxygen are respectively trivalent and tetravalent. The conception involved in this new formulation explains a large number of well known facts in a very satisfactory manner. It accounts for the difference between solutions of ammonia and of the alkaline hydroxides, and for the existence of isomeric quaternary ammonium salts. By means of it the formation of metal-ammonia compounds and of diazonium salts, the reduction of diazonium derivatives to hydrazine, and the process of diazotisation are all capable of simple representation.

#### OUR ASTRONOMICAL COLUMN.

**SPECTRUM AND ORBIT OF  $\delta$  ORIONIS.**—Some very interesting results have been obtained by Dr. Hartmann in a research carried out at Potsdam on the spectrum and orbit of  $\delta$  Orionis. The variability of the velocity in the line of sight—or, as Dr. Hartmann prefers to designate it, the “oscillation”—of this star was first discovered by Prof. Deslandres at Meudon, who determined the period as 1.92 days, and the orbit as very eccentric. Dr. Hartmann’s results, however, do not confirm these conclusions, for he finds the period and the eccentricity to be

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and 0.10334 respectively.

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A striking feature on the spectrograms obtained is that the calcium line at  $\lambda$  3934 (“K”) is always sharp, whilst the other lines are characteristically hazy, and it does not share in the periodic displacements of the lines caused by the orbital motion of the star. Seeking an explanation of this anomalous behaviour, Dr. Hartmann has arrived at the conclusion that the absorption producing K does not take place in either of the components of the  $\delta$  Orionis system, but in a separate “cloud” of calcium vapour situated somewhere between that system and our own. The distance of this cloud cannot be determined, but Dr. Hartmann suggests that its extent, perpendicular to the line of sight, might be approximately determined by the observation of the K line in stars situated in the same region and having “oscillations” similar to those of  $\delta$  Orionis (*Astrophysical Journal*, No. 4, vol. xix.).

**ANOMALOUS DISPERSION AND SOLAR PHENOMENA.**—A further exposition of anomalous dispersion, and its action relative to solar phenomena, by Prof. W. H. Julius, appears in No. 10 (May 30) of the *Revue générale des Sciences*. After reviewing the current theories as to the sun’s physical constitution, Prof. Julius proceeds to demonstrate that the “apparent” excessive speed of prominence variations, the abnormal solar spectrum photographed by Prof. Hale in 1894, the periodical variation of the solar radiation, the eleven-year period of solar activity, the connection between allied terrestrial and solar phenomena, and several other phenomena, may all be explained by considering the relative geometrical positions of the sun and earth, and the consequently variable distorted paths of the solar radiations. For example, he states:—“The eleven-year period may be the combined consequence of a progressive variation (not necessarily periodic) of the system of the surfaces of discontinuity and the periodic displacement of the Earth in regard to the rotating mass of the Sun.”

**PRIMITIVE CONDITIONS OF THE SOLAR NEBULA.**—An interesting mathematical study of the conditions which probably obtained in the primitive solar nebula has been communicated to the Academy of Science of St. Louis by Mr. Francis E. Nipher, and is published in No. 4, vol. xiv., of the academy’s *Transactions*. According to the equations developed by the author, it seems impossible that at the time when the planets were separating from the parent mass the nebula was wholly gaseous. The idea that the planets were formed from condensing swarms of meteorites is the only reasonable one which conforms with the numerical results obtained. It also appears that at the times when the moon separated from the earth, and Mercury from the sun, the respective parent masses must have been in the solid state, the sun having fused and become vaporised since the separation of Mercury. Further, it seems unnecessary, and even improbable, that the earth should ever have been in a state of fusion. By substituting the proper conditions in one of his general equations, Mr. Nipher finds that the isothermal  $7000^{\circ}$  C. is probably the one existing at the sun’s surface at the present time.

**INVARIABILITY OF SPARK AND ARC WAVE-LENGTHS.**—In a paper communicated to No. 4, vol. xix., of the *Astrophysical Journal*, Messrs. Eder and Valenta describe the results they have obtained from a series of experiments performed in order to test the various theories as to the variability of wave-lengths, in arc and spark spectra, with the amount of vapour present or with the nature of the electric stimulus used.

As the result of his experiments, Prof. Haschek proposed, in a paper published in February, 1902, a system of quantitative analysis based on the measurement of the amount of “shift” a line experienced when varying quantities of the material under analysis were used. Taking most stringent precautions to eliminate subjective photographic effects, Messrs. Eder and Valenta have shown that these “shifts” do not really exist, and they state their conclusions in the following words:—(1) That at ordinary atmospheric pressure there exist no relative shifts between the arc and spark spectra as were said by Exner and Haschek to occur; (2) that there also exist no shifts in the spark spectrum which could be attributed to a reduced quantity of the element present in the vapour.